2.2 The Saving Function and Induced Saving

Consider the above figure (consumption C against real disposable income Y_D): when consumption is less than disposable income, total saving is positive; when more, negative. This can occur, at least for a while, by drawing down savings accounts, by realising assets, or by borrowing — remember, saving and consuming are *flow* magnitudes.

The fraction of an extra dollar of disposable income that is not consumed is the *marginal propensity to save*, or s. By definition, each extra dollar of income must be consumed or saved, so

$$c + s = 1$$

Induced saving is the portion of saving that responds to changes in income. The *saving function* is just disposable income minus the consumption function. It is also equal to the amount of induced saving minus autonomous consumption.

$$S = -a + sY_D$$

So total saving S is induced saving sY_D minus the amount of autonomous consumption a. For instance, when Y_D is zero, induced saving must also be zero, and total saving is equal to minus $12.5 billion, the level of autonomous consumption. The saving function plus the consumption function equals disposable income.

The figure below plots household consumption against household disposable income over the period 1948/49 to 1984/85. The gap between the

45° line and the solid consumption line is saving, which is also shown on the next graph.

3. Equilibrium Income

3.1 Planned Investment Spending

We have assumed neglect of interest rates and monetary policy; we have assumed a fixed price level; assume too that there is no foreign trade and that both government expenditures and tax revenues are zero. Total expenditures on GDP include only consumption and private domestic investment.

Given the level of planned investment, what determines the total level of real GDP? (We assume that the level of planned investment is a parameter, for the moment.)

Assume that planned autonomous investment (I_p) is $25 billion per year. Other parameters are autonomous consumption (a = $12.5 billion) and the marginal propensity to consume (c = 0.75). For the moment, we assume that none of these three changes with income.

3.2 Total Planned Expenditures

The total of household and business purchases, or planned expenditures (E_p), is the amount of household consumption (C) plus business planned investment (I_p):

$$E_p = C + I_p$$

Substituting the consumption function for C:

$C \equiv Y_D$

C

100

50

20

10

5

5   10   20   50   100
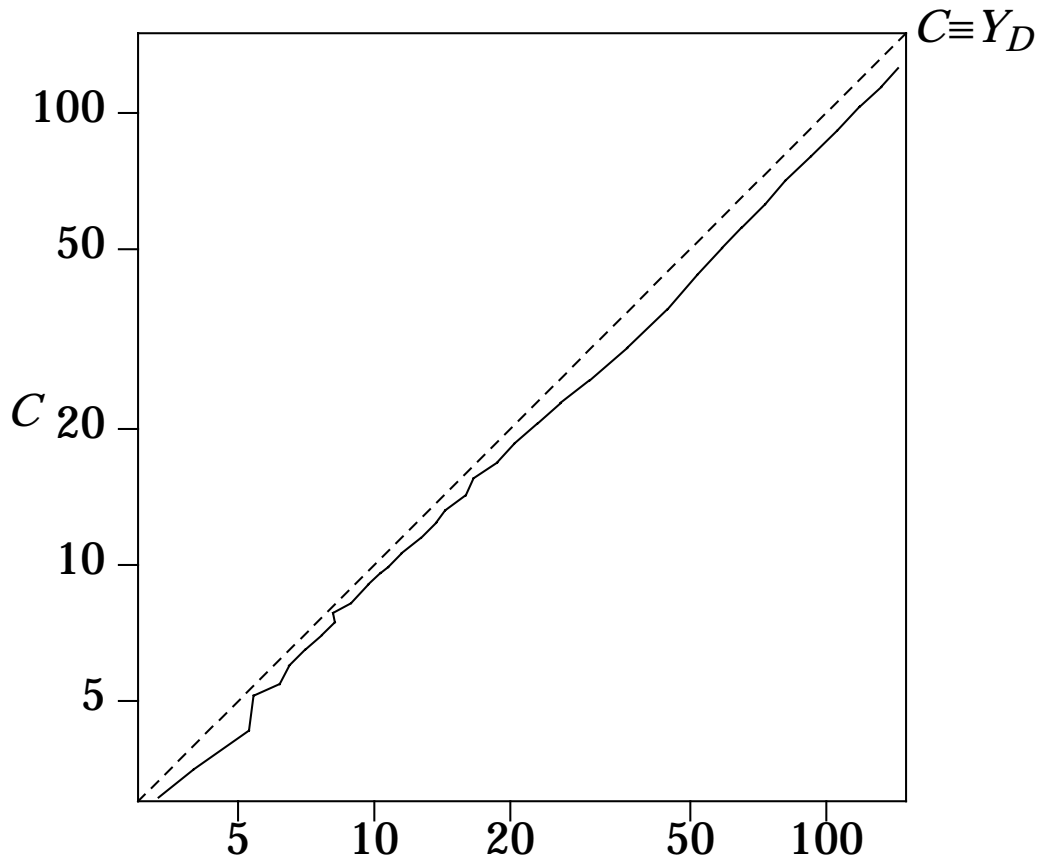
Disposable income Y_D, $ billions/year

Australian Consumption and Saving, 1948/49–1984/85

$\dfrac{Y_D - C}{Y_D}$

0.15

0.1

0.05

1950   1960   1970   1980

Year
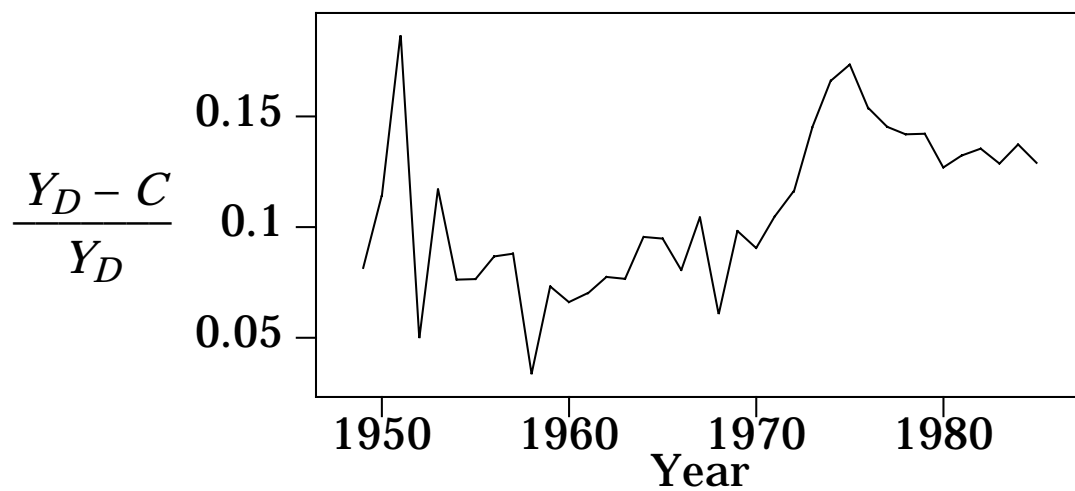
Australian Savings Ratio, 1948/49–1984/85

$$E_p = a + cY + I_p$$

(Note that under the assumption of no business saving and no taxes, total real income Y equals disposable income Y_D.)

3.3 When is the Economy in Equilibrium?

We must distinguish between *actual* expenditures (E) and *planned* expenditure (E_p). In the simple economy of households, firms, and the capital market, we saw that actual expenditures and total income are always equal by definition, or $E \equiv Y$. But there is no reason for income always to equal *planned* expenditures (E_p).

Equilibrium is a state in which there exists no pressure for change. In this context, the economy is in equilibrium when income is equal to planned expenditures; only then do households and firms want to spend exactly the amount of income that is being generated by the current level of production, all of which can be sold to households and firms.

When the economy is out of equilibrium, production and income are out of line with planned expenditures, and firms will be forced to raise or lower production. When the economy is in equilibrium, firms are happy, on average, to continue with the current level of production.

This notion is illustrated in the figure: The economy is only in equilibrium at one point: when planned expenditures (E_p) equal actual (E), which occurs at the level of real production or income (Y) where the two lines intersect.

Real income (*Y*)
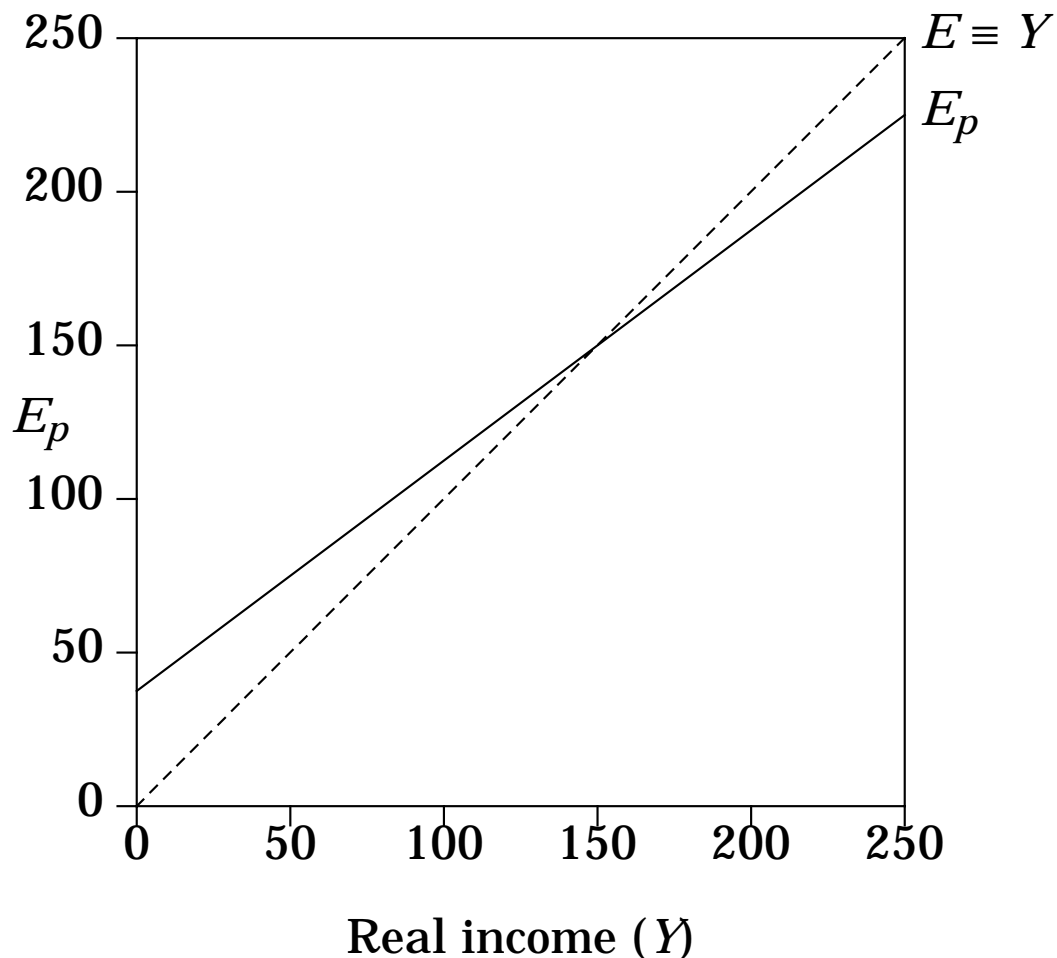
3.4 *Out of Equilibrium?*

At production or incomes greater than $150 billion (the intersection point), actual production exceeds planned expenditures, so inventory stocks rise; at production or incomes less than $150 billion, actual production falls short of planned expenditures, so inventory stocks fall (if they exist). This *unintended inventory investment* (I_u) is the amount firms are forced to accumulate when planned expenditures are less than income; they can be positive or negative.

For instance, when income is $200 billion, the three components of planned expenditure are:

$$
\begin{array}{rcl}
\text{planned autonomous investment } (I_u) & = & 25 \\
\text{induced consumption } (0.75\,Y) & = & 150 \\
\text{autonomous consumption } (a) & = & 12.5 \\
\hline
\therefore \text{ planned expenditures } (E_p) & = & 187.5
\end{array}
$$

Thus at an income level of \$200 billion, planned expenditures are only \$187.5 billion, leaving firms with \$12.5 billion of unwanted merchandise, which is counted as inventory investment in the national accounts, but which is unwanted, since not included in planned investment (I_p).

Firms will respond to this buildup by cutting production and income, which moves the economy to the left, until unintended inventory investment disappears, at equilibrium, when firms are producing exactly the amount demanded.

At any income level, by definition income and actual expenditures are equal ($Y = E$), and expenditures are given by:

planned spending ($E_p = C + I_p$) + unintended inventory accumulation (I_u).

Only when $I_u = 0$ will income equal planned expenditure ($Y = E$).

3.5 Autonomous Planned Spending Equals Induced Saving

Another way of characterising equilibrium is that equilibrium occurs at the level of production or income where induced saving (sY) equals planned autonomous spending (A_p).

Subtract induced consumption (cY) from both sides of the definition of equilibrium ($Y = E_p$):

$$Y - cY = E_p - cY$$

We can replace the RHS by its equivalent, A_p, which is simply total planned expenditures (E_p) minus induced consumption (cY):

$$(1 - c)\, Y = A_p = a + I_p$$

or

$$s\, Y = A_p$$

because the marginal propensity to save s equals 1 minus the marginal propensity to consume c.

Thus equilibrium can only occur if induced leakage into saving (sY) just balances planned autonomous spending (A_p) injected back into the spending stream.

The equilibrium level of income in this simple model is always equal to planned autonomous spending (A_p) divided by the marginal propensity to save (s):

$$Y = \frac{A_p}{s}$$

Equilibrium income adjusts to generate enough induced saving to balance planned autonomous spending.

4. The Multiplier Effect

A change in planned autonomous spending (A_p) will cause a change in equilibrium income. What if managers become more optimistic (or less pessimistic), raising their guess as to the likely profitability of new investment projects: they

increase their investment spending by \$12.5 billion, boosting A_p from \$37.5 billion (A_{p0}) to \$50 billion (A_{p1}).

4.1 Calculating the Multiplier

Change the parameter A_p, keeping the marginal propensity to save (s) constant — ceteris paribus, or all else equal.

Take new income $Y_1 = \dfrac{A_{p1}}{s}$ $Y_1 = \dfrac{50}{0.25} = 200$

Minus old income $Y_0 = \dfrac{A_{p0}}{s}$ $Y_0 = \dfrac{37.5}{0.25} = 150$

$\therefore$ Change in income $\Delta Y = \dfrac{\Delta A_p}{s}$ $\Delta Y = \dfrac{12.5}{0.25} = 50$

The change in income (ΔY) is the change in autonomous expenditure (ΔA_p) divided by the marginal propensity to save (s). The *multiplier* (k) is defined as the ratio of the change in income (ΔY) to the change in autonomous spending (ΔA_p) that causes it.

$$\text{multiplier } k = \frac{\Delta Y}{\Delta A_p} = \frac{1}{s}$$

In our numerical example, the multiplier equals $\dfrac{1}{0.25}$, or 4.

4.2 Example of the Multiplier in Action

Consider an increase in planned investment by American Airlines in 1988 to purchase \$2 billion of Boeing 757 aircraft. Initially, Boeing's workers in Seattle (using our simple model) would find their incomes rising by \$2 billion; but using our

marginal propensity to consume c of 0.75, they would spend $1.5 billion of their additional income in Seattle shops and stores. The stores would have to reorder $1.5 billion worth of merchandise from firms across the country, causing workers at these firms to receive $1.5 billion in additional income, of which ¾ or $1.125 billion would be spent. In these three rounds of extra income and extra spending, income has risen by $2 plus $1.5 plus $1.125 billion = $4.625 billion. Induced consumption is increased at each round, and eventually the total increase in income will be four times the initial increase in planned investment, or $8 billion (= $2 billion times $\dfrac{1}{¼}$).